

# MONITORING ARSENIC (III) IN WATER SUPPLIES USING ANODIC STRIPPING VOLTAMMETRY AND A DIAMOND ELECTRODE

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## Abstract

Arsenic contamination in drinking water can cause not only short term poisoning but also chronic medical effects such as keratosis, dyspigmentation, skin lesions, and skin and internal cancers even at low part-per-billion (ppb) levels.<sup>1</sup> The inorganic trivalent form is the most toxic.<sup>2</sup> Current methods of analysis such as atomic absorption spectrometry and inductively coupled plasma mass spectrometry are expensive, time consuming and unsuitable for on-site detection.<sup>1</sup> Electrochemical methods, like anodic stripping voltammetry (ASV) are easy to operate, sensitive, fast, portable, and a less expensive alternative for arsenic detection.<sup>3</sup> However, electrode materials currently used are limited by toxicity, stability and sensitivity issues.<sup>4</sup>

Boron doped diamond (BDD) is a relatively new alternate electrode material for ASV. Its low background current, large potential window and long term stability distinguish BDD from conventional electrode materials.<sup>5</sup> Some preliminary results of arsenic (III) detection in 1 M HCl with a diamond thin-film electrode modified by co-deposited gold particles will be presented. Detection of arsenic on diamond was characterized by cyclic voltammetry (CV) and atomic force microscopy (AFM). Factors affecting the ASV detection such as deposition potential, deposition time, and gold (III) concentration were optimized. The LOD with a gold (III) concentration of 100 ppb at the optimized conditions was determined to be 0.005 ppb, the linear dynamic range under these conditions was 0.005 ppb-40 ppb. A sensitivity of ca. 0.01  $\mu\text{A/ppb}$  was achieved. The RSD was ca. 5% with 10 consecutive runs.

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